Enhancing livelihoods through livestock knowledge systems (ELKS)

Phase end report (2011–15)

CGIAR

RESEARCH PROGRAM ON Livestock and Fish

ILRI PROJECT REPORT


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Enhancing livelihoods through livestock knowledge systems (ELKS)

Phase end report (2011–15)

A partnership between the Sir Ratan Tata Trust and its Allied Trusts, and the International Livestock Research Institute (ILRI)

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Contents

Project overview 2

Research support provided to NEIDA in northeast India 4

- Control of classical swine fever 5
- Human disease risk assessment in the pork value chain 6
- Study of wild forages 7

Research support to Himmotthan in Uttarakhand 9

Research support to CInI in Jharkhand 12

- Project management 12
- Project finances 13

Achievement against planned outcomes and impact 15

- Project implementation challenges 16

Key learnings 18

Documents /publications /videos 20

Project overview

Enhancing Livelihoods through Livestock Knowledge Systems (ELKS) is a partnership program funded by Sir Ratan Tata Trust and its Allied Trusts, and the International Livestock Research Institute (ILRI). This ambitious initiative was initiated in 2011 to help enhance the Trust's partners capacities to improve livestock-based livelihoods in the hilly/ tribal areas in northeast India (pig value chain), Uttarakhand (dairy and goat value chains) and Jharkhand (goat and pig value chains) by 1. conducting adaptive research to fill knowledge gaps .2. strengthening institutional mechanisms and 3. facilitating pro-poor policies.

Among other things, some of the most significant lessons learned from this project spread over a period of five years (including an inception phase of one year) comprise:

- Early and tight engagement with non-governmetal organization (NGO) partners which had significant experience of the areas and their problems—and were open-minded about the possible contribution of research—led to some very well-focused researchable issues that the project was able to tackle effectively and with full commitment from its development partners. As it was need-based research, the project could make an impact in addressing real issues faced by smallholder women and men farmers on the ground. This program is a classic example of research for development (R4D), where the development partners directly used the research outputs (research into use) as and when they were available.
- A number of specific solutions were identified by predominan research (e.g. epidemiological study on classical swine fever, a trial on dual purpose cereals for food-feed production for cattle etc.) and development activities (e.g. animal health services targeted at farmers in remote locations, the supply of dual purpose crop seeds etc.). The cross fertilization of research and development activities in this project to come up with integrated solutions to specific problems has been one of its strengths. The wider scalability of these solutions remains to be seen. It will require active participation of multiple actors of key importance and of course large resources. Opportunities for scaling might be through partnership with public sector service providers.
- An inclusive approach and strong awareness of the institutional environment shows promise for supporting wider scaling (e.g. study on nutritional gap and the establishment of a mini-feed unit). Right from planning stage, all the stakeholders, especially those mandated by the state for the specific job, were taken on board and involved throughout the study. Dialogue with policy makers was taken seriously. Looking at who will be around in ten years from now to ensure continuity is a sound approach. These are the actors, particularly government agencies, who will ensure the sustainability of the activities. If only the farmers can ensure sustainability of the approach, then the solutions have to take this into account. Capacity requirements will vary in the long run (i.e. also required to adapt to changing circumstances).
- Evidence-based policy facilitation added value to the R4D work (e.g. study on the impact of classical swine fever led to announcements that both a swine fever control program and vaccine production in the country would be initiated. The policy impact has wider implications on the ground.

Research support provided to NEIDA in northeast India

The North East Initiative Development Agency (NEIDA) of the Tata Trusts, among other things, provides financial, monitoring and supervisory support to farmers for piggery development through NGOs in Nagaland and Mizoram. This includes support for pigsty construction, piglet production, feed utilization, disease prevention and insurance. ILRI worked with NEIDA and its NGO partners to strengthen the whole initiative through innovations in technology and delivery mechanisms. Some of the key ELKS support activities of ILRI in northeast India included:

Livestock service delivery model

Access to a dependable quality animal health service is a major constraint to improving the productivity of livestock enterprises in norteastern India. There are insufficient state-employed veterinary doctors and veterinary field assistants to provide effective and dependable animal health services, especially in the more remote and hilly areas. Hilly terrain, and poor road connectivity and transportation facilities, make the veterinary-service delivery even more difficult for rural people from the stand point of the amount of time consumed and expenses required to get the job done. Under these circumstances, a collaborative (government-NGO) model has been developed and tested to deliver animal health services under the auspices of the ELKS project. In Nagaland, local youth have been selected by village councils to become Livestock Service Providers (LSPs). Before the villagers started the selection process, they were briefed by ILRI about the service delivery program and the required qualities of local candidates. The village youth who were selected to become LSPs were given training consisting of five modules totaling 30 days delivered at different locations over an 18-month period. Designed by ILRI, the trained was jointly delivered by the veterinary department and ILRI. In addition to the training, veterinary department staff provided technical support to the trained LSPs, as and when required. ILRI, NGO partners and community members closely monitored the performance of the LSPs and rapidly introduced corrective measures when needed, including designing and providing refresher training.

The LSPs were supplied with basic animal health kits, including small vaccine carriers, which enabled them to ensure vaccines were kept at the correct temperature until administered. The principal vaccine needed for pigs is for classical swine fever (CSF) which is the most serious threat to pig production in the state. Farmers were expected to pay for the services they received, with the fees fixed by the village councils. It is not envisaged that the LSPs earn a living from the services they provide; rather this is seen as a part-time activity from which they will be able to earn Indian Rupees (INR) 1000–2000/ month. The main objective is to ensure the provision of essential and otherwise unavailable animal health services (deworming, vaccination, first aid, and advice on hygienic practices to prevent disease occurence) to small-scale pig rearers in their communities.

The major advantage of this approach for livestock keepers is to help those, previously unable to access any kind of animal health care services, to gain easy access to affordable preventive health care services on their farms. Livestock keepers contact the LSPs either by visiting them at home or by calling them by phone. LSPs then visit the farmer's house/farm within a short time period, depending the proximity. It was found that LSPs could cover almost 80% of households in their villages, indicating a significant increase in **accessibility**. Regarding the impact on **affordability**,

it was noticed that farmers paid a lower than normal fee, 90% less than than in areas where services were available. Looking at impact on mortality, it was noticed that the preventive health care services offered by the LSPs could reduce pig **mortality** drastically in all the project villages. For instance, no cases of death were reported due to swine fever or other diseases after the LSPs took up their positions. Mortality had previously been 20-30%.

After witnessing this success, the Government of Nagaland (Department of Veterinary and Animal Health) decided to scale up the model throughout the state in a phased manner. It will begin by raising awareness of the approach in each village, followed by identifying and selecting LSPs who will need to take the ILRI-developed modular training. Successfully-trained candidates will then be provided with a health kit. The government department is in the process of identifying financial resources to mainstream the model.

Improvement of pig nutrition

Farmers in the rural areas of Nagaland and Mizoram, generally feed their pigs with local vegetation, cooked together with kitchen waste available in their houses. However, this type of feeding practice might not supply the required amount of nutrients to the animals, resulting in a longer rearing period. Hence, with a view to assess the nutritional value of the given feed, dry matter intake and nutritional deficiency/surplus, a nutritional gap study was conducted in collaboration with Assam Agricultural University. The analysis concluded that the traditional diet could not meet the total nutritional requirements of pigs to enable acceptable productivity and that supplementary concentrates should be fed to bridge the nutritional gap. It was calculated that, on average, just over half a kilogram of supplementary ration needs to be fed per day, or 30% of the total feed requirement, to meet the nutrient gap. To address the gap, a supplementary—high protein (20.67%) and high energy (3.67 ME MCal)—compound ration was developed. It contains maize (42%), wheat bran (15%), rice polish (12%), groundnut cake (20%), fish meal (8%), mineral mix (2%) and common salt (1%), plus the amino acids, lysine and methionine, and vitamins.

The concentrate supplementary feed was produced locally in a mini pig feed mill (with a small feed grinder and mixture) at a state-run pig breeding station at Medziphema. The mill was established as part of a collaborative arrangement between ILRI and the state Veterinary and Animal Husbandry Department, in which ILRI provided technical support in feed formulation and production. The department provided the land, infrastructure and machinery.

To test these rations under local conditions and also to expose local farmers to the benefits of the compound rations, feeding trials were carried out with two treatments: i. full replacement of local feeds with compound feed and ii. supplementation with 500g for pigs up to 40kg and 1kg for pigs above 40kg. By the end of the 180 day trial, pigs which received the supplementary feed gained an additional 27kg of weight compared to the control group. The additional profit per pig was, therefore, INR1475. Accordingly, a farmer who owns 2 pigs, farrowing 1.5 times a year, is expected to earn an additional INR 4425 annually. It is also anticipated that for farmers who breed pigs, supplementary feeding will result in two additional piglets per year—the total value of these additional piglets is INR 4000.

With a view to upscaling the successful experience of production and supply of nutritionally balanced pig feed, the government of Nagaland has decided to produce feed on a commercial basis and supply pig rearers. Towards this end, they utilized unused land and infrastructure in Burma camp, Dimapur, belonging to the Department of Veterinary and Animal Health. With the support of NEIDA and ILRI, the modernization work and the preparation of a business plan is in progress. It is expected that feed production will begin not later than 2015.

Control of classical swine fever

CSF, a highly contagious viral disease of pigs, is reported to be the most serious threat affecting pig production in norteast India. Although swine fever vaccine is produced in India, it is not available in sufficient quantities and importation is not allowed as there is a likelihood of introducing new virus strains in the country. There are also reports of vaccination failure, but the reasons are unclear. Vaccine delivery mechanisms are reportedly very weak.

Generally Lapinized CSF vaccine is used in the country for control of CSF. The biggest limitation of this technology is its absolute dependence on the availability and continuous supply of rabbits. Therefore, the government has plans to produce *Lapinized Cell Culture Vaccine*, which will eliminate the need for rabbits, facilitating the production of unlimited quantities of the vaccine.

In this context, ILRI with the support of Tata Trusts carried out an epidemiological and a policy study to raise the awareness of policy makers about this issue. Consequently, the government of India approved a national program on swine fever control, designating northeast India as priority zone and starting with pro-active states. The program was planned to be implemented by the Livestock Health Division of the Department of Animal Husbandry, Dairying and Fisheries (AHDF), within the Ministry of Agriculture, and R S Rana (Joint Secretary) was appointed as the nodal officer. The proposed national program also included provision of support for strengthening cold chain facilities, raising awareness of farmers and the training of vaccination scouts. In 2013, the AHDF made token provision for the proposed national program in the 12th Plan, and later that year the national control program was launched and funds were transferred to four northeastern states (Manipur, Meghalaya, Arunachal and Tripura). AHDF is currently awaiting proposals from the three other northeastern states (a proposal from Nagaland has been received very recently).

AHDF also issued clearance for the production of *CSF lapinised cell culture vaccine* at one of the institutes of Animal Husbandry and Veterinary Biological (in Bangalore). After getting a 'trial license', it has already completed a field trial and validated the effectiveness of the new cell culture vaccine. It has now almost completed its laboratory and will soon be ready for inspection by the authorities. The authorities, after examining good manufacturing practices (GMP) compliance and other facilities of the Institute, will shortly issue it a license for the commercial production of the cell culture vaccine. It may take a few more months before commercial production of the vaccine begins.

In the meantime, Indian Immunological in Hyderabad, secured the *lapinised cell culture* technology and vaccine from Indian Veterinary Research Institute (IVRI) and secured 'a trial license' to conduct field trials. They have already proceeded for clinical trials, validation, etc. While commercial production of cell culture vaccine by Indian Immunological will take about two years, that by Animal Husbandry and Veterinary Biologicals, Bangalore, should take place within a couple of months. To a great extent, this is expected to resolve the issue of vaccine shortage in the country.

Human disease risk assessment in the pork value chain

A study by ILRI indicates that "in Nagaland, as elsewhere in the northeastern region, there is little or no formal infrastructure for slaughter of pigs or display of pork. This raises concerns about public health issues related to food safety" (Deka and Thorpe 2008). Therefore, a participatory epidemiological study was conducted in Nagaland with the objective of identifying the human health hazards and risks amplifying and/or mitigating practices. This was done in association with the Veterinary and Animal Husbandry Department and the Nagaland Empowerment of People through Economic Development, one of the Tata Trust partners. The study was carried out in two pork value chains: 1. rural pork meat production chain and 2. urban Kohima pork chain. It included interaction and focus group discussions with all actors in the chain. For conducting rapid diagnostic tests for several pathogens, faecal and blood samples at slaughter and meat samples from butchers' premises were taken. The results showed that there are hazards and risks to human and animal health associated with pig production, marketing and consumption (Table 1). Village-slaughtered pigs and village pork meat show fewer hazards than slaughter pigs imported from other states or countries (Myanmar) and their meat sold on the market.

Table 1: Human health hazards associated with pig production

At slaughter level	
6% pigs tested positive for *Brucellosis* (all town butchered, imported pigs)	
7.5% pigs tested positive for Cysticercosis (all town butchered ,imported pigs)	
4% meat samples with antibiotic residues (comprising village and town pigs)	
Butcher level	Consumer level
Total aerobic bacteria counts: 46% of samples highly (>10000CFU/g) and further 19.8% unacceptably contaminated (>100000CFU/g); town>village *Entero bacteriaceae* present in 83.5% of meat samples and >1000 CFU/gin 75%; town>village *Listeria spp* present in 32% of samples; town>village Purchase time has an influence on bacterial cell counts: Meat sampled early (7-9.30am) significantly less contaminated than meat sampled later during the day($p<0.01$)	High pork consumption, high incidence of self-reported gastro-intestinal illness: 83% report illness in the last 6 months; 32% report illness last month. However, consumption of pork does not predict illness 99% boil meat >60min; 96% eat cold left overs, most without re-heating, most after >12 hours Evidence of possible cross-contamination when preparing food

Study of wild forages

In the northeast, pig production is severely constrained by a chronic deficiency of concentrate feeds (82.6%) and green fodder (53.6%). Therefore, many farmers resort to feeding their animals with wild forages from local forests. For instance, in Nagaland wild forages constitutes about 40% of daily diet of pigs. But there is not much information available about the nutritional quality of these forages. In this context and to fill the gap, ILRI in collaboration with the National Research Centre on Mithun (NRCM), carried out a study with a view to promote use of these alternate feed resources for their efficient utilization at farm level.

The study was carried out in four selected districts of Nagaland representing different altitudes in two seasons (July-August and January-February). In each district, forage samples were collected (those exceeding more than 5% of total dry matter in the ration), taxonomy identified and dried ground samples were analysed at the NRCM and ILRI laboratories for proximate principles and anti-nutritional factors.

Most of the plants analysed were found to contain crude protein (CP) ranging from 6.61 to 29.97%. Neutral detergent fibre (NDF) and acid detergent fibre (ADF) are observed to be 55.15% and 37.97%, respectively. In vitro organic matter digestibility (IVOMD) in selected forages were observed to vary between 46.78 to 66.52%. The total phenolic compounds (Tannic acid equivalent) and cyanogenic glycosides content found to vary between 0.59 to 31.46% and 0.003 to 0.059%, respectively. The cyanogenic glycoside was observed only in 3.9% of the forages. The analysis gives an impression that all the forages evaluated are good sources of protein and energy with no significant levels of total phenolic compounds and glycosides that could make nutrients unavailable to the animals. However, a few plants containing higher levels of total phenolic compounds need to be assessed for their nutraceutical effects. Finally, it can be concluded that all the tested forages available in the forests in Nagaland can be promoted among farmers for feeding pigs/mithun. Some of the promising species such as *Colocasia spp*., *Debregeasia longifolia*, *Ficus hispida* and *Trema orientalis* can be cultivated in the back yard/homestead.

Research support to Himmotthan in Uttarakhand

Uttarakhand is one of the north Indian states comprising 13 districts, of which four have large areas in the plains, whereas the other nine comprise the hill region. The majority of the State's rural population depends upon subsistence agriculture of which livestock forms an integral part. Livestock (mainly cattle and buffaloes) in the hills are mainly reared for agricultural purposes. They are local breeds with low genetic potential for milk production and depend mainly on forests for grazing. A lack of breeding facilities, a poor service delivery system, fodder shortages and an absence of marketing facilities act as constraints to dairy development in the hills.

Given this reality, the Himmotthan Society (an initiative of Tata trust) and its NGO partners initiated an integrated livestock development project in the mountain regions of the state. To strengthen their efforts, ILRI provided research support in a few critical areas such as:

- Nutritional improvement of dairy animals
- Breed development
- Goat production

Nutritional improvement:

The nutritional improvement program was carried out by systematically assessing the feed situation in the project sites. A tool developed by ILRI called FEAST (Feed Assessment Tool: www.ilri.org/feast), was used to provide an overview of the farming system, major income sources, the livestock production system, the major feed resources throughout the year, and the potential for interventions. The analysis, among other things, showed that improved community management of common grazing resources appears promising for reducing feed scarcity. In terms of feed interventions, there is limited potential for on-farm fodder production due to land scarcity. Labour required to fetch tree fodder is a major demand on the system and any potential intervention needs to aim to produce more high quality feed material within the close proximity of homesteads.

Further, to gain an in-depth understanding on the nutritional status of dairy animals, a nutritional gap study was undertaken to assess season-wise availability of nutrients, requirement and gap of lactating cattle/buffaloes in Tehri and Pithoragarh districts of Uttarakhand. The results showed that in both the regions, the animals were underfed in terms of quantity (dry matter) and quality (crude protein and metabolisable energy). Based on this new knowledge, after the prioritization of potential interventions, suggestions were made to reduce the nutritional deficiencies using different feed technologies. As conventional approaches tended to focus on finding technical solutions with no/less consideration on the 'enabling factors' required for successful technology adoption, we employed a tool called TechFit (developed by ILRI: www.ilri.org/techfit) to collect, structure, screen and prioritize possible feed technologies and interventions using a set of general approaches, generic classifications and critical parameters from multiple angles (technical, institutional, social and economic). This helped to prioritise context-specific technologies. Thus, the following technologies were prioritized for implementation in Uttarakhand:

- Thinning dual purpose crops (wheat, barley)
- Smart feeding (targeted use of bought-in concentrates for productive animals)

As the first technology prioritized (dual purpose crops) did not have empirical evidence, a farmer-managed trial was carried out in farmers' fields. Considering the fact that wheat is the main crop cultivated during winter in the hilly tracts of Uttarakhand, the trial focused on analysing performance of two wheat varieties (local variety and VL 829 dual purpose variety) on fodder, grain and straw yields. The trial suggested that in the case of wheat, harvesting fodder 79-85 days after sowing (of the improved variety VL 829) is a boon in animal feeding as it produces significant quantity of additional green fodder (about 3.20 MT/ha) in the lean season without any significant reduction in the grain and straw yields. The green fodder is a bonus; fed at a rate of 10kg/ cow, buffalo or bullock/day to supplement straw, this would provide more than a month's green fodder for one animal. In the case of barley, improved variety (BHS 380) performed better in terms of fodder, grain and straw yields compared to the local variety. Printed literature, posters and a video were produced and used to promote this technology widely among farmers. Based on the encouraging results and promotional seminars, more farmers are currently using this technology in the field.

Towards smart feeding (the second technology selected), an assessment of feed production unit (run by the Central Himalayan Rural Action Group) was carried out and provided practical suggestions to Himmotthan to set up mini-feed mixing units for the production of nutritionally balanced feeds. A draft plan with details on required machineries (grinder, mixer) and their specifications, machine suppliers, floor design, output etc. were also provided for use.

Cattle/buffalo breed improvement model

The Uttarakhand Livestock Development Board (ULDB), formed by the state government is implementing programs for developing cattle and buffalo breeds in the state. Unfortunately, it was found that most of their services are mainly confined to the plain regions of Uttarakhand and do not reach the farmers in the hills. Against this background, a collaborative model for breed development in the hills was developed in association with Himmotthan and ULDB, under which ULDB provided training to village-based youth as artificial insemination (AI) workers (cum paravet), and supplied semen, liquid nitrogen, LN2 container and other equipment. ILRI support was provided in the form of a technical review of AI workers, refresher training, and the arrangement of health camps and supply of extension materials. This model has increased access of livestock keepers living in the hilly areas to breeding and animal health care services. It has also increased the confidence of livestock keepers in these districts to invest in other livestock productivity enhancing technologies, such as feeding, better housing and management. The AI workers have enabled the ULDB to extend the reach of its services beyond the plains and into the hilly areas. The livestock keepers in the project area reported that they had confidence in and valued the services provided by the health care workers. While they regarded state employed veterinarians and paravets as figures of authority, with the health workers, who were members of their own communities, they found it much easier to access timely services at affordable rates.

Goat development

It is not possible to progress dairying in the hilly areas of Uttarakhand beyond a particular stage as large milk surpluses cannot be absorbed by the local market and become uneconomical to transport to the plains. In this context, small stock development often provides a less risky investment for the poor in the hills compared to cattle or buffalo. Further, it is reported that in Uttarakhand, as in the entire country, the demand for goat meat is growing fast. This is expected to offer considerable opportunities for the smallholders in a state like Uttarakhand where large numbers of goats/sheep are presently imported from other states to meet the requirement. In this respect, ILRI carried out a desk study and a goat value chain assessment, which were ultimately used to develop a goat project in the state. This project is currently being implemented by Himmotthan with funding from Tata Trusts. In association with Central Institute for Research on Goats, ILRI provides this project with technical support in the design of a model for developing superior germplasm (through selective breeding) for improved goat production.

Research support to CInI in Jharkhand

Considering the huge potential of goats and pigs for poverty reduction among marginal communities in the tribal areas of Jharkhand, ILRI conducted a study to understand the strengths and weaknesses of various goat and pig development models implemented by different agencies in Jharkhand. The study results were used by CInI to develop and implement a comprehensive goat/pig development project. The project had all essential components (breeding, feeding, health control, extension, marketing, farmer-based institutions and capacity building) required for a successful livestock-based livelihood improvement program. In this project, ILRI acted as a technical supporter and provided specific backup in the following areas:

- epidemiological study, based on which recommendations were adopted on the use of broad spectrum/specific anthelmintic for control of internal parasites in goats
- analysis of soil mineral availability using soil maps and mineral inclusion in goat diets
- analysis of ready-made compounded feeds and development of least cost feed formulation for pigs
- analysis of growth performance of pigs based on recording
- development of piglet procurement protocol
- development of a vaccination and deworming calendar
- training to goat and pig service providers (LSPs) and project coordinators
- designing functions and the incentive structure for LSPs
- preparation of extension/ICT materials
- development of technical bulletins on buck selection, health control of goats, goat feeds and pig feed compounding
- support in production of a documentary video film on various pig management practices
- preparation of 'knowledge resource compendium" for partners

Apart from these, ILRI provided regular hands-on assistance and needs-based advisory support to CInI and its partners

Project management

The ELKS program was managed by a senior program manager, supported by research associates (one in each research site), ILRI thematic experts and short-term local and international consultants hired as needed. The required expertise was appropriately identified and the right mix of experts were mobilized largely from India and wherever not available, from the ILRI global pool.

The program was guided by a steering committee (SC) consisting of members mainly from the Trusts' three initiatives. The SC provided strategic direction and oversight to help improve the relevance and impact of the project. The

committee also provided overall guidance and support for the main activities and overall strategic direction in the ELKS program by identifying major trends and opportunities, or gaps in implementation. Yearly work plans were drawn up through discussion with partners, approved by the Trusts and evaluated at the end of every year. Quarterly progress reports (narrative and financial) were prepared and submitted by ILRI apprising the development.

To facilitate smooth field level coordination between ILRI and the Trusts' Cells and partners mechanisms, such as monthly apprisal, quarterly meetings etc., were put in place and reviewed from time to time.

Project finances

The project had a financial outlay of over INR 49,569,000, of which the Trusts contribution was INR 44,962,000 for the three-year period (2011-2013). Considering the balance available at the end of the project phase in December 2013, the Trust sanctioned a no-cost extension up to March 2015 (first for one year and then for three months) with a new set of related activities. As of March 2015, the total amount spent was over INR 45,116,000 retaining a balance of over INR 21,93,000 (including interest earned). During the project period, apart from ILRI/ICRISAT annual audits, the Trusts' auditors conducted two financial audits. A mid-term evaluation was also carried out by external consultants appointed by the Trust.

Achievement against planned outcomes and impact

The research outputs and knowledge generated (including materials, policies, strategies, practices etc.) on value chain enhancement through feeding and breeding strategies, animal health and marketing of pigs, goats and cattle/buffalo in northeast India, Uttarakhand and Jharkhand were effectively used by partners in implementing livestock development activities for poverty reduction.

1. Achievements in northeast India

Knowledge generated through research on pig nutrition, studies on classical swine fever, analysis of wild forages etc. and models tested for delivery of livestock services through village-based youth have been successfully used by partners in Nagaland. Extension materials and research papers produced on the subjects are used by farmers, practitioners and development agents. Policy facilitation persuaded the government to take decisions for mainstreaming the research outputs (e.g. scaling up of service delivery model and establishing pig feed mill). Some of the research outputs acted as evidence to influence policy makers resulting in the declaration of national swine fever control program and CSF vaccine production in the country. Thus, the project significantly contributed to the pig value chain development work in the region. The project also contributed to enhancing the capacity of project partners and stakeholders in terms of new knowledge, its field application and mechanisms of networking and policy facilitation.

2. Achievements in Uttarakhand

Research results on dual-purpose crops convinced farmers to use field-tested varieties in subsequent seasons. Work on nutrition of dairy animals and dual-purpose crops helped partners to acquire new knowledge on various aspects of nutritional improvement. The service delivery model tested to extend livestock services to remote locations through public-private partnership has been appreciated by all, including government. Activity on goat germplasm development is having an impact in the field. Extension materials generated are extensively used by partners for the promotion of dairy- and goat-based innovations in the project locations and beyond. Though the government system is convinced about the effectiveness of various piloted models, the mainstreaming of such is being delayed by state bureaucracy.

3. Achievements in Jharkhand

Support and hands-on assistance provided to CInI and its partners developed their capacity in terms of knowledge/skills on goat and pig nutrition and management. Partners used the knowledge acquired to effectively implement livestock-based livelihood projects in the state. Technical support in terms of epidemiological study, an assessment of mineral availability using soil mineral maps, nutritional analysis of commercial feeds, fecal sample analysis for worm identification etc. contributed to the development of the pig value chain in project villages. Extension materials (bulletins, leaflets) on technical subjects are used by the partners, as well as farmers.

4. Capacity development (northeast, Uttarakhand, Jharkhand)

The various training programs delivered to the partners and stakeholders as part of the project include: M&E training, participatory epidemiology, participatory disease risk assessment, pig nutrition, dairy animal feeding, fibre fortification, cattle/buffalo breeding, FEAST/TechFit tools, and LSP trainings on different livestock production subjects. International training was also given to selected representatives of partners and NEIDA, Himmotthan and CInI project staff on pig-feed milling, goat breeding and dairy farming. In addition to providing collaborative working experience on research and development, these programs enhanced partner capacities on technical issues, soft skills and in policy facilitation.

Project implementation challenges

In places where the bureaucracy is not very pro-active (Uttarakhand, Jharkhand), the mainstreaming of project outputs has been slow. This creates frustration among partners. Even though it did not affect the impact at the initiative level, scaling up of results outside the project remains as a challenge. Working with the national research system, though rewarding, has at times created disappointments in terms of procedural and operational delays and poor responses.

Key learnings

1. To improve the adoption of research outputs, research organizations should work with development initiatives beginning with the diagnosis of the problem.

2. Sometimes we could see R4D as 'just' development. In some cases, this is undoubtedly the case as research that has a focus on development processes and outcomes is complex to implement and can fall by the wayside. However, the ELKS project has, to its considerable credit, managed to maintain a combined focus on both the Yin and the Yang of R4D. Some factors that would appear to have contributed to this are:

    a. The operating mode of Tata Trusts as the donor facilitated a rapid engagement with NGO development partners who already had a strong appreciation of some of the core problems faced by livestock farmers in the project areas. They also appreciated the support that the research provided by ILRI's involvement could provide them in areas where they lacked knowledge and capacity (e.g. in the identification of research-based solutions).

    b. Strong partnerships facilitated the cycling through activities with varying foci on research or development, while maintaining continuity towards the project's ultimate outputs/outcomes.

3. Involvement of government machinery (AH Department, Ministry of DAHF, ICAR etc.) in all activities right from the beginning helps in developing ownership of outputs with large outreach components through mainstreaming of research results.

4. If the ELKS project has demonstrated one thing, it is that strong, equitable partnerships between organizations whose primary focus is research and organizations whose primary focus is development can facilitate a genuine, integrated R4D process. The challenge for any follow up activity is to identify ways in which the outputs of this process can be assimilated at scale. This will require institutional arrangements that will be needed for scaling the project's innovations (including support for knowledge transfer, capacity building amongst all stakeholders as required and long-term exit strategies for project partners and donors).

5. Once research outputs are produced, using/promoting them by the development initiatives requires vibrant mechanisms on a continuing basis within the initiatives.

6. Outcomes (use of research outputs) are sometimes constrained by a lack of resources for scaling up/out.


AR-01 B-7934

Documents/publications/videos

Documents/ publications/ videos generated as part of the project during the project period (2011-2015) are listed in Table 2:

No.	Title of document/publication/video
1	Report on feed assessment in Uttarakhand using FEAST Tool http://ilrihyd.wikispaces.com/file/detail/Feed%20Ass%20in%20UKD%20using%20FEAST%20tool.pdf
2	Feeding practices and nutritional gap in lactating buffaloes of Tehri and Pithoragarh Districts in Uttarakhand http://ilrihyd.wikispaces.com/file/detail/Feeding%20practices%20and%20NG%20in%20Uttarakhand.pdf
3	Analysis of WHEAT varieties in Tehri and Pithoragarh districts of Uttarakhand (India) for impact of green fodder harvest on grain and residue yields with and without berseem under different fertilizer management http://ilrihyd.wikispaces.com/file/detail/Analysis%20of%20dual%20purpose%20wheat%20in%20Uttarakhand.pdf
4	Analysis of BARLEY varieties in Tehri and Pithoragarh districts of Uttarakhand, India for fodder, grain and residue yields under different management http://ilrihyd.wikispaces.com/file/detail/Analysis%20of%20dual%20purpose%20barley%20in%20Uttarakhand.pdf
5	Assessing the potential to change partners' knowledge, attitude and practices on sustainable livestock husbandry in India http://ilrihyd.wikispaces.com/file/detail/Assessing%20the%20potential%20to%20change%20partners%20KAP.pdf
6	Feasibility study of mini-feed mixing units (Uttarakhand) http://ilrihyd.wikispaces.com/file/detail/Feasibility%20study%20of%20mini-feed%20mixing%20unit%20at%20Chirag.pdf
7	Impact narrative on "green fodder from dual purpose wheat" http://ilrihyd.wikispaces.com/file/detail/Impact%20narrative%20%28Dual%20P%20crops%29.pdf
8	Impact narrative on "improving access to breeding and animal health services in disadvantaged locations in Uttarakhand" http://ilrihyd.wikispaces.com/file/detail/Impact%20narrative%20%28paravet%20system%29.pdf
9	Impact narrative on "an approach to select locally appropriate technologies to support livestock intensification" http://ilrihyd.wikispaces.com/file/detail/Impact%20narrative%20%28Dual%20P%20crops%29.pdf
10	Impact narrative on "fodder production in common property resources" http://ilrihyd.wikispaces.com/file/detail/impact%20narrative%20fodder%20in%20CPR.pdf
11	Impact narrative on "decentralized dairy units" http://ilrihyd.wikispaces.com/file/detail/Impact%20narrative-dairy.pdf

No.	Title of document/publication/video
12	Goat sector in Uttarakhand: An Overview http://ilrihyd.wikispaces.com/file/detail/Goat%20sector%20overview%20in%20Uttarakhand.pdf
13	Study of goat value chain in Uttarakhand and recommendation for goat based livelihood improvement http://ilrihyd.wikispaces.com/file/detail/Study%20of%20goat%20value%20chain%20in%20Uttarakhand.pdf
14	Goat market study in Almora http://ilrihyd.wikispaces.com/file/detail/Goat%20market%20study%20in%20Almora.docx
15	Pig production, management and marketing in the North East Indian state of Nagaland: A situational analysis http://ilrihyd.wikispaces.com/file/detail/Pig%20prodn%2C%20mgmt%20%26%20mktg%20in%20NE-Situational%20analysisFinal%20Baseline%20Report-Pig%20Production%2C%20Management%20and%20Marketing%20in%20Nagaland.pdf
16	Current scenario of livestock development and potential interventions for livelihood improvement: The cases of Arunachal Pradesh and Mizoram http://ilrihyd.wikispaces.com/file/detail/Current%20scenario%20of%20liv%20devpt%20in%20Arunachal%20%26%20MizoramSECTOR%20STUDY%20%28FINAL%29.pdf
17	Disease Risk Assessment in Pig value chain: A constructive study in Nagaland http://ilrihyd.wikispaces.com/file/detail/Disease%20risk%20assess%20in%20pig%20value%20chain%20in%20NGLD.pdf
18	Incidence and impact of Classical Swine Fever in North East India http://ilrihyd.wikispaces.com/file/detail/Incidence%20%26%20impact%20of%20CSF%20in%20NE%20India.pdf
19	Production, delivery and efficacy of Classical swine Fever vaccine in North East India http://ilrihyd.wikispaces.com/file/detail/Prodn%2C%20delivery%20%26%20efficacy%20of%20CSW%20vaccine%20in%20NE%20India.pdf
20	Policy brief on Classical swine Fever in North East India: Prevention and control measures http://ilrihyd.wikispaces.com/file/detail/SwineFever_Policybrief_final_PrintVersion.pdf
21	Nutritional gap of growing pigs in some areas of Nagaland and Mizoram http://ilrihyd.wikispaces.com/file/detail/NG%20of%20growing%20pigs%20in%20NGLD%20%26%20Mizoram.pdf
22	Training Report on Local Feed Resource Based Pig Nutrition (with special reference to NE India) http://ilrihyd.wikispaces.com/file/detail/Training%20Report%20on%20pig%20nutrition.pdf
23	Impact narrative on "prevention of classical swine fever in North East India" http://ilrihyd.wikispaces.com/file/detail/Impact%20narrative%20%28CSF%20control%29.pdf
24	Impact narrative on "model to improve pig nutrition using local resources for market oriented pig production in Nagaland" http://ilrihyd.wikispaces.com/file/detail/Impact%20narrative%20%28pig%20feed%20improv%29.pdf
25	Impact narrative on "improving access to animal health services in disadvantaged location in Nagaland" http://ilrihyd.wikispaces.com/file/detail/Impact%20narrative%20%28service%20delivery%29.pdf
26	Availability and nutritional value of wild forages as feed for pigs and mithun in Nagaland http://ilrihyd.wikispaces.com/file/detail/PR_forest_based_forages_PRINT.pdf
27	Potential for livelihood improvement through livestock development in Jharkhand http://ilrihyd.wikispaces.com/file/detail/JharkhandReport.pdf

No.	Title of document/publication/video
28	Current scenario of livestock development and potential interventions for livelihood improvement: Case of Jharkhand, India http://ilrihyd.wikispaces.com/file/detail/Current%20scenario%20of%20liv%20devpt%20in%20Jharkhand.pdf
29	Analysis of goat and pig development models in Jharkhand and neighbouring States http://ilrihyd.wikispaces.com/file/detail/Analysis%20of%20goat%20%26%20pig%20devpt%20models%20in%20Jharkhand.pdf
30	Technical bulletin "compounding nutritionally balanced feed for pigs" http://ilrihyd.wikispaces.com/file/detail/Tech%20Bulletin%201%20%28compounding%20pig%20feed%29.pdf
31	Technical bulletin "goat health management" http://ilrihyd.wikispaces.com/file/detail/Tech%20Bulletin%202%20%28Goat%20Health%20Management%29.pdf
32	Technical bulletin "buck selection for breed improvement" http://ilrihyd.wikispaces.com/file/detail/Tech%20Bulletin%203%20%28%20Buck%20selection%29.pdf
33	Technical bulletin "feeding goats" http://ilrihyd.wikispaces.com/file/detail/Tech%20Bulletin%204%20%28Feeding%20Goats%29.pdf
34	Portal on ELKS-Uttarakhand http://www.himmotthan.in/details.php?pgID=sb_7
35	Video on "dual purpose wheat and barley for human food and livestock feed in Uttarakhand" http://www.himmotthan.in/details.php?pgID=sb_7

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